CLAIMS

1. An ultrasound transducer probe, comprising:

a support substrate having a non-linear surface;

an integrated circuit physically coupled to the support substrate overlying the non-linear surface, wherein said integrated circuit substantially conforms to a shape of the non-linear surface; and

an array of piezoelectric elements coupled to said integrated circuit.

2. The ultrasound transducer probe of claim 1, wherein said integrated circuit is physically attached to the support substrate via at least one of an adhesive and an epoxy.

3. The ultrasound transducer probe of claim 1, wherein the non-linear surface of said support substrate includes a smooth curved surface.

4. The ultrasound transducer probe of claim 3, further wherein the smooth curved surface has a radius of curvature selected as a function of a desired ultrasound transducer probe application, wherein the desired ultrasound transducer probe application includes one selected from the group consisting of a cardiac application, an abdominal application, and a transosophageal application.

5. The ultrasound transducer probe of claim 1, wherein said integrated circuit has a thickness on the order of approximately 5-50 μm.

6. The ultrasound transducer probe of claim 1, wherein said integrated circuit includes an active region, said ultrasound transducer probe further comprising:

a passivation layer overlying the active region of said integrated circuit, wherein a thickness of said integrated circuit and a thickness of said passivation layer are selected to assure that neutral fibers of a bend structure coincide with the active region of said integrated circuit, wherein the bend structure includes that of said integrated circuit and said passivation layer.

7. The ultrasound transducer probe of claim 6, wherein the active region of said integrated circuit includes circuitry for performing at least one of control processing and signal processing functions of said ultrasound transducer probe.

8. The ultrasound transducer probe of claim 1, wherein said integrated circuit includes at least one of a silicon based, a gallium based, and a germanium based integrated circuit.

9. The ultrasound transducer probe of claim 1, wherein said array of piezoelectric elements includes a two-dimensional array of piezoelectric transducer elements.

10. The ultrasound transducer probe of claim 1, wherein said array of piezoelectric elements is coupled to said integrated circuit via flip-chip conductive bump connections.

11. The ultrasound transducer probe of claim 1, wherein said support substrate includes a highly thermally conductive material, the conductive material having a thermal conductivity in a range on the order of 45 W/mk to 420 W/mk.

12. The ultrasound transducer probe of claim 1, wherein said support substrate includes a highly acoustic attenuating material, the attenuating material for attenuating acoustics in a range on the order of 10 dB/cm at 5 MHz to 50 dB/cm at 5 MHz.

13. The ultrasound transducer probe of claim 1, further comprising:

a protective layer overlying the array of piezoelectric elements, said protective layer having a shape substantially conformal to said array of piezoelectric elements and the non-linear surface of said support substrate.

14. The ultrasound transducer probe of claim 13, wherein the shape of said protective layer includes a radius of curvature substantially on the order of a radius of curvature of said array of piezoelectric elements and the non-linear surface of said support substrate.

15. The ultrasound transducer probe of claim 13, wherein said protective layer includes polyethylene.

16. An ultrasound transducer probe, comprising:

a support substrate having a non-linear surface;

an integrated circuit physically coupled to said support substrate overlying the non-linear surface, wherein said integrated circuit substantially conforms to a shape of the non-linear surface, and wherein said integrated circuit includes an active region and a passivation layer overlying the active region, wherein a thickness of said integrated circuit and a thickness of the passivation layer are selected to assure that neutral fibers of a bend structure coincide with the active region of said integrated circuit, wherein the bend structure includes that of said integrated circuit and the passivation layer; and

an array of piezoelectric elements coupled to said integrated circuit via flip-chip conductive bump connections.

17. The ultrasound transducer probe of claim 16, wherein the non-linear surface of said support substrate includes a smooth curved surface having a radius of curvature selected as a function of a desired ultrasound transducer probe application, wherein the desired ultrasound transducer probe application includes one selected from the group consisting of a cardiac application, an abdominal application, and a transosophageal application.

18. The ultrasound transducer probe of claim 17, wherein said integrated circuit has a thickness on the order of approximately 5-50 μm.

19. The ultrasound transducer probe of claim 16, further comprising:

a protective layer overlying said array of piezoelectric elements, said protective layer having a shape substantially conformal to said array of piezoelectric elements and the non-linear surface of said support substrate.

20. An ultrasound diagnostic imaging system adapted for use with an ultrasound transducer probe, said ultrasound transducer probe comprising:

a support substrate having a non-linear surface;

an integrated circuit physically coupled to the support substrate overlying the non-linear surface, wherein said integrated circuit substantially conforms to a shape of the non-linear surface; and

an array of piezoelectric elements coupled to said integrated circuit.

21. A method of fabricating an ultrasound transducer probe, comprising:

providing a support substrate having a non-linear surface;

physically coupling an integrated circuit to the support substrate overlying the non-linear surface, wherein the integrated circuit substantially conforms to a shape of the non-linear surface; and

coupling an array of piezoelectric elements to the integrated circuit.

22. The method of claim 21, wherein coupling the array of piezoelectric elements to the integrated circuit includes coupling via flip-chip conductive bump connections.

23. The method of claim 21, wherein the integrated circuit includes an active region and a passivation layer overlying the active region, wherein a thickness of the integrated circuit and a thickness of the passivation layer are selected to assure that neutral fibers of a bend structure coincide with the active region of the integrated circuit, wherein the bend structure includes that of the integrated circuit and the passivation layer.

24. The method of claim 21, wherein the integrated circuit has a thickness on the order of approximately 5-50 μm.

25. The method of claim 21, further comprising:

overlying a protective layer with respect to the array of piezoelectric elements, the protective layer having a shape substantially conformal to the array of piezoelectric elements and the non-linear surface of the support substrate.

26. The method of claim 25, wherein the shape of said protective layer includes a radius of curvature substantially on the order of a radius of curvature of said array of piezoelectric elements and the non-linear surface of said support substrate.

27. The method of claim 25, wherein the protective layer includes polyethylene.